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Alternobaric Vertigo: Incidence in Portuguese Air Force Pilots

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Abstract

Alternobaric Vertigo is a sudden and transient vertigo caused by asymmetrical changes in middle ear pressure (Lündgren – 1965). These changes are directly related to the daily activity of aircraft pilots (and divers). This vertigo strikes often in critical maneuvers (attacks or evasions) causing sudden disorientation. We used an anonymous enquiry, multiple-choice type, preceded by a briefing about alternobaric vertigo. We found 29% of the pilots with 1 or more episodes of alternobaric vertigo, all being caused directly by rapid ascents and/or brisk Valsalva maneuvers.

Introduction

Alternobaric Vertigo is a sudden and transient vertigo caused by asymmetrical changes in middle ear pressure (Lündgren – 1965). These changes are directly related to the daily activity of aircraft pilots (and divers), which implies variation of altitude (or depth). This vertigo typically lasts few seconds, with prompt *restitutio ad integrum*, and no organ damage is observed. The precise physiopathologic mechanism is not known, even though several studies have been made searching for circulatory, thermal or pressure changes in internal ear, as well as anatomical variations.

Its importance derives from the fact that it strikes often in critical maneuvers (attacks or evasions) causing sudden disorientation.

Known in divers since 1896, and observed in pilots since 1937, was first coined "Alternobaric Vertigo" by Lündgren in 1965. Probably (predictably) fairly common in high-performance aircrafts, as well as in divers:

RAF pilots 10% - Jones, 1956 [3]
Swedish Air Force Pilots 17% - Lündgren 1966 [4]
Divers 26% Lündgren 1965 [4]

It is assumable that pilots are reluctant to report such symptoms and so these data are most likely underestimated…

The importance of this situation drove our Aeronautical Medical Center to enquire our high performance pilots, to get *au pair* of our numbers, as well as to learn more about how to prevent and deal with it.

Materials and Methods

It was used an anonymous enquiry, multiple-choice type, preceded by a *briefing* about alternobaric vertigo. We included questions about specific details of the episode, as well as risk and precipitating factors.

This quiz was filled by 12 Alphajet and 12 F16 pilots (about 2/3 of our pilots flying each of these aircrafts)

Results

More than predicted by previous studies, we found 7 pilots with 1 or more episodes of alternobaric vertigo (29%): 3 in F16, 2 in Alphajet, 1 in Epsilon and 1 on the floor prior to flying. In 5 cases there were more than 1 episode. We were unable to determine a relation between the number of episodes and the total flown hours; even though, 5 pilots have more than 1000h. No incidents were officially reported.

Characteristics:

In most cases, the vertigo was rotary horizontal, with 2 episodes of sagital vertigo. All but 1 episode were not accompanied by other symptoms, the exception being tinnitus.

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Precipitating factors

All the episodes were precipitated either by rapid ascent or by Valsalva maneuver.

Risk factors

About 71% (5) of the episodes were connected with recent or contemporary upper respiratory tract infection. 1 pilot has history allergy with predominant terrain in the upper respiratory tract. 59% (4) of the referred pilots are smokers (14% light smoker, 28% moderate and 14% heavy). 28% (2) mentioned chronic recurrent upper respiratory tract afflictions (sinusitis, rhinitis…). Only 1 pilot had no identified risk factors. None of our study pilots had had adenoidectomy.

Discussion

Even though we had few pilots to enquiry (24), the numbers were impressive in two ways: the problem seems more common than expected, probably because of the increased performance of the aircrafts since the studies presented, in spite of the fact the selection methods are more careful nowadays. The second striking aspect was the role clearly present for the precipitating factors, having all the episodes being caused directly by rapid ascents and/or brisk Valsalva maneuvers, demonstrating the critical role of pressure changes in this type of vertigo. Confirming this datum are the risk factors that were almost omnipresent.

As this vertigo is typically brief and self-limited, one can only prevent it and limit its consequences:

-Learn to promptly recognize it and deal with it properly – leveling the flight, limiting the pressure changes.

-Avoid flying with active risk factors – UTI, active allergy…

-Avoid smoking and other respiratory irritants.

-Avoid precipitating factors – make frequent and progressive Valsalva maneuvers, especially when flying low level or 100% O_2.

-Pilots should pay frequent visits to the flight surgeon, to rule out any Eustachian tube dysfunction

-Flight surgeons should also keep pilots on continuous formation, including this subject in physiology refreshment courses.

Finally we remind that Alternobaric Vertigo is (as we've seen) an important cause of sudden spatial disorientation, leading to sudden incapacity in flight that cannot be omitted when investigating causes for aircraft accidents.

It is also obvious that it is also important to divers, for the same mechanism(s) inflicts the same pressure changes in the middle ear.

The fact of being brief and self-limited should not minimize it's importance in our minds. It can occur at any critical time!

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